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## EUROPEAN PATENT APPLICATION

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(71) Applicant: AB VOLVO, Torslanda, S-405 08 Göteborg (SE)

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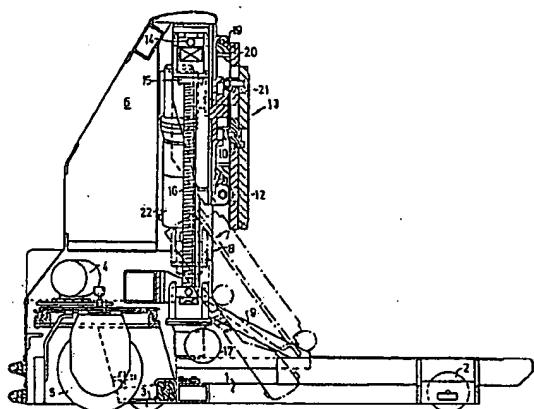
(72) Inventor: Fäger, Gunnar, Gamla Kungsvägen 79,  
S-54132 Skövde (SE)

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(74) Representative: Hellbom, Lars Olof et al, H. Albinhs Patentbyra AB Box 7664, S-103 94 Stockholm (SE)

(54) Motordriven vehicle for assembly and transport of heavy components, such as engines, transmissions, etc.

(57) The invention relates to a carrier vehicle for assembly and transport of components, such as engine components or complete engines. The carrier vehicle is provided with a fastening means (13), which is carried by a carriage (10), which is displaceable along parallel rails (7) on a vertical stand (6). The rails have a vertical upper portion (8) and an inclined lower portion (9), which means that the fastening means are subjected to a tipping movement when the lower portion of the carriage (10) is moved out on the inclined rail portions with the aid of a driven screw (16) rotatable in the frame, which screw engages a ball-nut (15) carried by the carriage of the fastening means.



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Motordriven vehicle for assembly and transport of heavy components, such as engines, transmissions, etc.

The present invention relates to a transport vehicle for assembly and transport of heavy components, such as engine parts and complete engines, during assembly operations, comprising a support frame with

5 at least three wheels, at least one of which is steerable and at least one of which is drivable by a motor, and a stand carried by the support frame, said stand carrying a rotatably mounted fastening means for the components.

10 Swedish Lay-open Print 392 588 reveals a transport vehicle of the above mentioned type, which is used as a carrier for final assembly of gasoline engines for passenger cars, i.e. for relatively light engines. This carrier vehicle has a fastening means  
15 with a turntable rotatable about a horizontal axis, to which turntable the rear end of the engine block is fixed. The fastening means itself is in turn rotatable about an axis inclined at a 45° angle to the horizontal plane, which means that all sides of the engine  
20 except the gearbox plane can be placed in a horizontal position. All of the repositioning operations are done manually with very little physical exertion required by virtue of the fact that the engines are relatively light and that the repositioning operations are done  
25 without changing appreciably the position of the engine center of gravity.

Heavier components, such as engines in weight classes from about 150 kg to 1600 kg cannot, for practical reasons, be assembled on carriers of the  
30 type described above. On the one hand, the manual repositioning operations would be too strenuous for the assemblers and, on the other hand, the carrier vehicle would have to be unreasonably broad to assure stability when rotating the fastening means about the

$45^{\circ}$  axis. Furthermore, the front end in the horizontal position would be at too high a level from an ergonometric point of view.

For these reasons and others self-propelled  
5 vehicles of this type have not been used for assembly  
of heavy components. The most common method of assembly  
up to now has been to move the components between  
various types of handling equipment or to disregard  
ergonometric requirements. The effects thereof have  
10 ranged from physical wear and possible disability of  
the assembly worker, handling damage to the components,  
bottom necks and reduced quality and profitability.

The purpose of the present invention is in  
general to achieve a carrier vehicle of the type  
15 described by way of introduction, which can be used  
for assembly of engines in the above mentioned heavy  
weight classes for examples.

This is achieved according to the invention by  
virtue of the fact that the fastening means is mounted  
20 on a carriage or slide displaceable along guides on  
the frame, said guides having portions with different  
angles of incline relative to a vertical plane to  
permit tipping of the fastening means.

The invention is based on the concept of  
25 dividing the assembly into two main steps, the first  
step involving the precision mounting of heavier  
components in the engine body using a steady indexable  
assembly line system with assembly units which can  
provide the desired quality and correct ergonomic  
30 design. The second assembly stage involves mounting of  
the transmission, the valve mechanisms, the fuel and  
lubrication systems and all of the external components.  
This is done on a carrier vehicle according to the  
invention, which thereby acts as a universal handling  
35 apparatus, providing wide variability to provide good  
access at the correct working height to all sides of  
the engine except the gearbox plane. By allowing the

tipping to be carried out as the engine is lowered, the front end thereof will automatically end up at an ergonomically suitable level.

The invention will be described in more detail  
5 with reference to an example shown in the accompanying drawing, where Fig 1 shows partially in section a side view of a carrier vehicle according to the invention, and Fig 2 shows partially in section a front view of the carrier vehicle in Fig 1.

10 The vehicle has a support frame 1 with a pair of fixed wheels 2, a pair of runners 3 and a wheel 5 which can be steered by a steering motor 4. The steerable wheel 5 is driven by a drive motor (not shown). The carrier vehicle is of the type which is designed to be  
15 remote-controlled in a known manner via signals from a control loop embedded in the floor, but the particulars concerning the remote-control system do not constitute a part of the present invention and will therefore not be shown or described in more detail here.

20 The support frame 1 carries a stand, generally designated 6, on one side of which a pair of parallel rails 7 are mounted. The rails have a vertical upper portion 8 and an inclined lower portion 9, and serve as a guide means for a carriage 10 for the fastening  
25 means, which is designed to carry an engine at its gearbox plane. The carriage 10 has an upper pair of wheels 11 which run against the side of the rails facing away from the carriage, and a lower pair of wheels 12 running against the side of the rails facing  
30 the carriage to take up the tipping moment which an engine carried by the fastening means 13 exerts on the carriage 10. At its upper edge, the carriage 10 is linked via shafts 14 with a ball-nut arrangement 15, which engages a screw 16 rotatably journaled in the  
35 stand, and which at its lower end is drivingly connected to a motor 17.

Rotation of the screw 16 with the aid of the motor 17 displaces the ball-nut and thus the carriage 10 upwards or downwards on the stand depending on the direction of rotation, thus making it possible to place

5 the engine carried by the fastening means at a level which is comfortable for the assembly worker regardless of whether he is short or tall. The adjustment is done with the aid of manual control means (not shown) disposed on the stand.

10 As the carriage 10 is displaced downwards along the vertical portion 8 of the rails, the engine is displaced parallelly. When the lower pair of wheels 12 of the carriage roll out onto the inclined lower portion 9 of the rails, the carriage will tip and  
15 finally assume the position shown with dash-dot lines in Fig 1. In the example shown in the Figures, the carriage is tipped at most  $35^{\circ}$  from its vertical position, but this angle can of course be varied for different applications.

20 In order to further facilitate access to the engine, the fastening means 13 is rotatable on the carriage 10. For this purpose the fastening means is fixed to a turntable 19 mounted on the carriage. The turntable 19 has an internal toothed rim 20 in engagement with a gear 21, which via a conical transmission is driven by a drive motor 22 carried by the carriage.  
25

In the preceding, the invention has been described with reference to an example relating to engine assembly, but the principle of the invention is  
30 of course not limited thereto. Rather, the carrier vehicle can of course also be used, after suitable adaption, as a handling apparatus for other heavy components than combustion engine components.

## CLAIMS

1. Vehicle for assembly and transport of components such as engine components or complete engines, comprising a support frame with at least three wheels, at least one of which is steerable and  
5 at least one of which is drivable by a motor, and a stand carried by the support frame, said stand carrying a rotatably mounted fastening means for the components, characterized in that the fastening means (13) is mounted on a carriage or slide (10) displaceable along guides (7) on the frame, said guides having portions (8,9) with different angles of incline relative to a vertical plane to permit tipping of the fastening means.

2. Vehicle according to Claim 1, characterized in that the guides (7) have an upper portion (8) lying in a vertical plane, and a lower portion (9) inclined relative to said plane, that the front end of a component, the rear plane of which is fixed in the fastening means, is tipped up as the carriage or slide 20 (10) passes from the vertical to the inclined portion.

3. Vehicle according to Claim 1 or 2, characterized in that the guides are formed by a pair of parallel rails (7) and that the fastening means (13) is carried by a carriage (10) with an upper wheel pair (11) running against the side of the rails facing away from the fastening means, and a lower wheel pair (12) running against the side of the rails facing the fastening means.

4. Vehicle according to any one of Claims 1-3, 30 characterized in that the carriage or slide (10) can be driven along the guides (7) by means of a screw (16) rotatably journaled in the stand and driven by a drive motor (17), which screw engages a nut device (15) joined to the carriage or slide.

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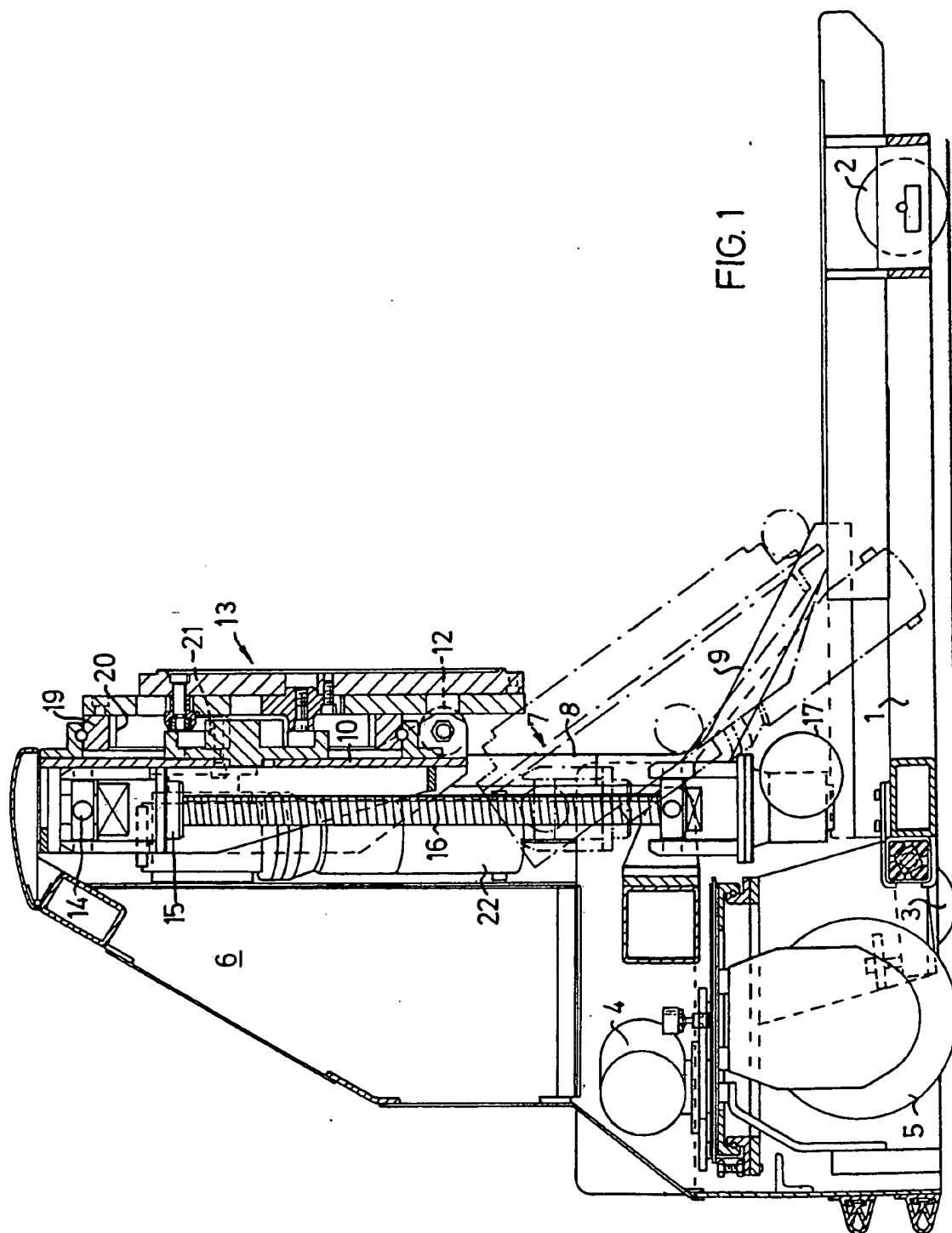
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5. Vehicle according to any one of Claims 1-4,  
characterized in that the carriage or slide (10)  
carries a drive motor (22) with a driven gear (21)  
which engages a toothed rim (20) on the fastening  
means (13).

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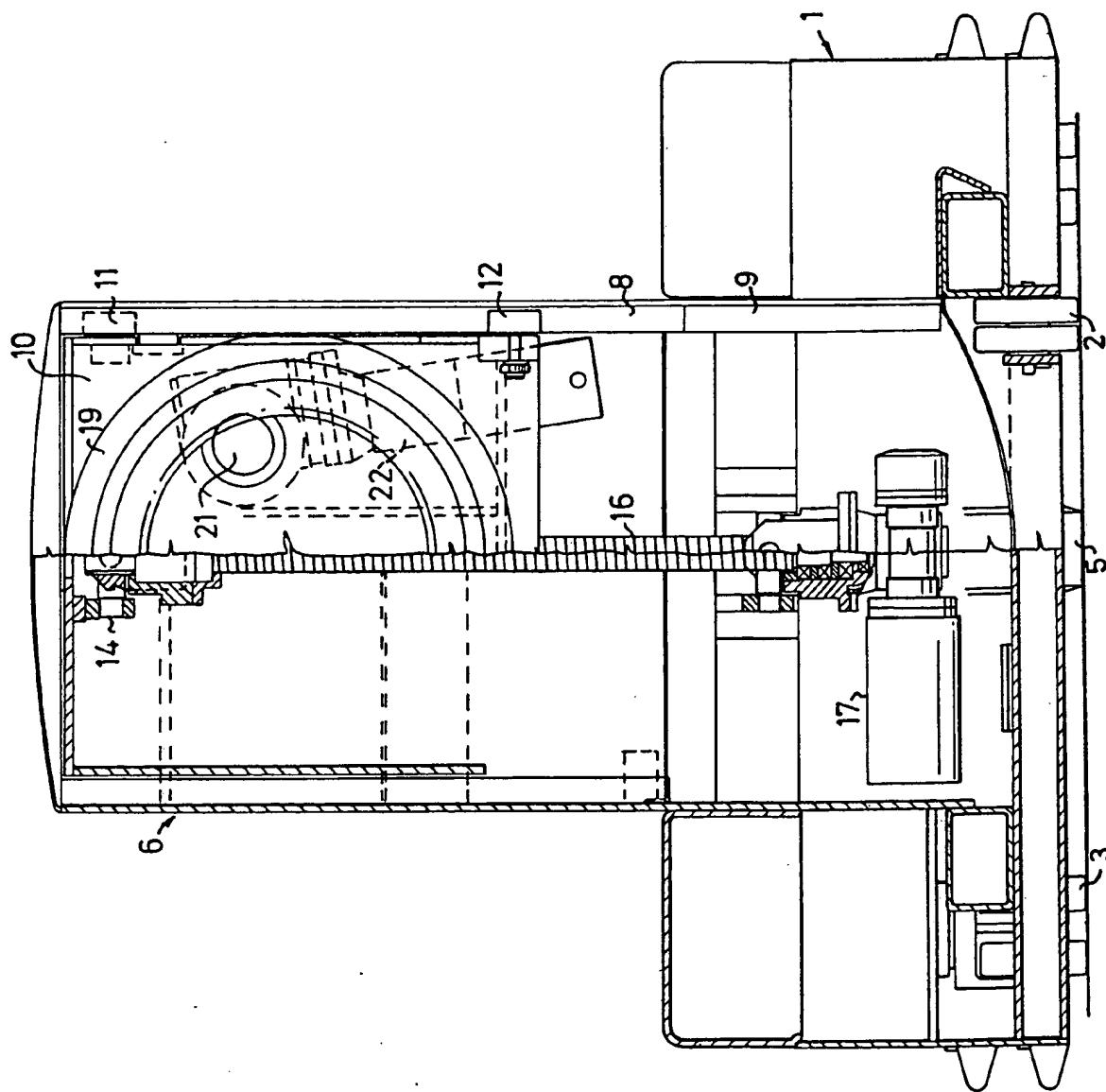
FIG. 1



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FIG.2





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**EUROPEAN SEARCH REPORT**

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Application number  
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<b>DOCUMENTS CONSIDERED TO BE RELEVANT</b>			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y, A	SE-B-392 588 (AB VOLVO) * Fig 1-2; claim 1* ---	1-5	B 25 H 1/10 B 60 P 3/00
Y	GB-B-1 363 344 (SOCIETE GENEVOISE D'INSTRUMENTS DE PHYSIQUE) * Fig 2; page 1, lines 54-91* ---	1-5	
Y	US-A-3 110 279 (T.G. BRASHEAR, JR) * Fig 2* ---	3	
A	SE-B-392 589 (AB VOLVO) ---		
TECHNICAL FIELDS SEARCHED (Int. Cl.4)			
B 23 Q B 25 H B 60 P B 62 D B 65 G			
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
STOCKHOLM	15-05-1986	JANSSON R.	
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	